

Claims

- [c1] 1. A data cartridge library comprising:
- a frame that defines an interior space;
 - a data cartridge magazine, operatively attached to said frame and located within said interior space, for providing a plurality of data cartridge storage spaces;
 - a drive, operatively attached to said frame and located within said interior space, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;
 - a transport assembly, operatively attached to said frame and located within said interior space, for moving a data cartridge between said data cartridge magazine and a drive that might be located in said drive bay, wherein said transport assembly comprises a picker that is capable of grasping a data cartridge and an elevator for moving said picker;
 - an entry/exit port that allows an entry/exit port magazine to be moved between an exterior space that is outside of said frame and said interior space;
 - wherein said entry/exit port comprises a mount to which an entry/exit port magazine can be attached and from

which an entry/exit port magazine can be detached, a guide for constraining said mount to move between a first position at which a user can attach/detach an entry/exit port magazine to/from said mount and a second position at which said transport assembly is capable of inserting/removing a data cartridge into/from an entry/exit port magazine attached to said mount, a motive device for providing a motive force for moving said mount between said first and second positions, and a first stop structure that is attached to said mount and engages a second stop structure to prevent said motive device from moving said mount beyond said first position; and a quick release that allows said first stop structure to be readily detached from said mount so that said mount can be removed from the library.

[c2] 2. A data cartridge library, as claimed in claim 1, wherein:
said quick release structure comprises a screw.

[c3] 3. A data cartridge library comprising:
a frame that defines a top surface, a bottom surface that is spaced from said top surface, and a side surface that extends between said top and bottom surfaces;
wherein said top, bottom and side surfaces define an interior space;
a data cartridge magazine, located within said interior

space, that is capable of holding a plurality of data cartridges;

a drive, located within said interior space, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;

a transport assembly, located within said interior space, for moving a data cartridge between said data cartridge magazine and said drive, wherein said transport assembly comprises a picker that is capable of grasping a data cartridge and an elevator for moving said picker within a portion of said interior space; and

a user interface that is associated with said side surface and exposed to an exterior environment;

wherein said side surface comprises a displaceable portion that is capable of being placed in: (a) an "open" state that allows a user to access said data cartridge magazine and said drive through said interior space, and (b) a "closed" state that prevents a user from accessing said data cartridge magazine and said drive through said interior space;

wherein said displaceable portion defines an opening for a user interface;

a user-actuable connector that allows a user to: (a) place said displaceable portion in said "closed" state, and (b) place said displaceable portion in said "open" state;

wherein said user-actuatable connector does not constrain said displaceable portion to rotate about an axis when moving between said "closed" and "open" states.

[c4] 4. A data cartridge library, as claimed in claim 3,
wherein:
said user-actuatable connector comprises a screw.

[c5] 5. A data cartridge library, as claimed in claim 3,
wherein:
said user-actuatable connector comprises a captured screw.

[c6] 6. A data cartridge library, as claimed in claim 3,
wherein:
said user-actuatable connector comprises a group of screws.

[c7] 7. A data cartridge library, as claimed in claim 3,
wherein:
said user-actuatable connector comprises a group of captured screws.

[c8] 8. A data cartridge library, as claimed in claim 3,
wherein:
said connector comprises a buckle.

[c9] 9. A data cartridge library, as claimed in claim 3,

wherein:

said connector comprises a clasp.

[c10] 10. A data cartridge library, as claimed in claim 3,

wherein:

said user interface comprises an entry/exit port that allows a user to insert/remove a data cartridge into/from the interior space.

[c11] 11. A data cartridge library, as claimed in claim 3,

wherein:

said user interface comprises a electronic display that allows a user to obtain information about the library.

[c12] 12. A data cartridge library, as claimed in claim 3,

wherein:

said user interface comprises an input device that allows a user to direct an operation of the library.

[c13] 13. A data cartridge library, as claimed in claim 3,

wherein:

said user interface comprises:

a entry/exit port that allows a user to insert/remove a data cartridge into/from the interior space;

an electronic display for providing a user with information;

an input device that allows a user to direct an operation

of the library.

- [c14] 14. A data cartridge library, as claimed in claim 3, wherein:
said displaceable portion comprises a screen.
- [c15] 15. A data cartridge library, as claimed in claim 3, wherein:
said displaceable portion comprises a window.
- [c16] 16. A data cartridge library, as claimed in claim 3, wherein:
said displaceable portion comprises a metal portion and a plastic portion.
- [c17] 17. A data cartridge library, as claimed in claim 3, further comprising:
a rail mount for mounting a rail that facilitates the association of the library with a rack.
- [c18] 18. A multi-piece data cartridge magazine that is suitable for use with a data cartridge library comprising:
a channel structure that defines an interior space that is capable of accommodating a plurality of data cartridges;
wherein said channel structure comprises a first side with a first side interior surface and a first side exterior surface;
wherein said channel structure comprises a second side

with a second side interior surface and a second side exterior surface;
wherein said second side is separated from said first side;
wherein said channel structure comprises a back side with a back side interior surface and a back side exterior surface;
wherein said back side extends between said first and second sides;
wherein said first side interior surface, said second side interior surface, and said back side interior surface define said interior space;
wherein said first and second sides define at least a portion of an opening for the insertion/extraction of data cartridge into/from said interior space;
said channel structure comprising:
a first channel structure that forms at least a portion of said back side;
a second channel structure that forms at least a first portion of said first side and at least a second portion of said second side; and
a coupler for connecting said first and second channel structures.

[c19] 19. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said second channel structure comprises an end portion that connects said first and second portions.

[c20] 20. A multi-piece data cartridge magazine, as claimed in claim 188 wherein:

said end portion does not form a substantial portion of said back side.

[c21] 21. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said second channel structure comprises:

a first end portion that connects said first and second portions; and

a second end portion that is separated from said first end portion and connects said first and second portions.

[c22] 22. A multi-piece data cartridge magazine, as claimed in claim 21, wherein:

said first and second end portions each do not form a substantial portion of said back side.

[c23] 23. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said first channel structure comprises:

a first channel structure first surface that forms a substantial portion of said first side of said channel structure; and

a first channel structure second surface that forms a portion of said back side of said channel structure.

[c24] 24. A multi-piece data cartridge magazine, as claimed in claim 23, wherein:

said coupler comprises:

a first coupler element that is associated with said first channel structure first surface; and

a second coupler element that is associated with said first portion of said first side formed by said second channel structure.

[c25] 25. A multi-piece data cartridge magazine, as claimed in claim 24, wherein:

said first coupler element comprises a recess/hole.

[c26] 26. A multi-piece data cartridge magazine, as claimed in claim 24, wherein:

said first coupler element comprises a flange.

[c27] 27. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said first channel structure comprises:

a first channel structure first surface that forms a portion of said first side of said channel;

a first channel structure second surface that forms a portion of said second side of said channel; and

a first channel structure back surface that forms a substantial portion of said back side of said channel.

[c28] 28. A multi-piece data cartridge magazine, as claimed in claim 27, wherein:

said coupler comprises:

a first coupler element that is associated with said first channel structure first surface;

a second coupler element that is associated with said first channel structure second surface;

a third coupler element that is associated with said first portion of said first side formed by said second channel structure; and

a fourth coupler element that is associated with said second portion of said second side formed by said second channel structure.

[c29] 29. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said portion of said back side comprises a stand-off structure for a data cartridge so that when a data cartridge that is properly positioned within said channel structure, a first surface of the data cartridge contacts said stand-off structure and a second surface of the data cartridge that is opposite from said first surface is at a predetermined distance from said back side.

- [c30] 30. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said first channel structure is made of metal.
- [c31] 31. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said second channel structure comprises a retainer for engaging a surface associated with a data cartridge so as to hold the data cartridge within said channel structure.
- [c32] 32. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said second channel structure is made of plastic.
- [c33] 33. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said second channel structure comprises a plurality of separation structures that each comprise an end portion that connects said first and second portions and does not form a substantial portion of said back side.
- [c34] 34. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said coupler comprises:
a first coupler element associated with said first channel structure; and
a second coupler element associated with said second

channel structure and capable of engaging said first coupler element.

[c35] 35. A multi-piece data cartridge magazine, as claimed in claim 34, wherein:
one of said first and second coupler elements comprises a spring element.

[c36] 36. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said first channel structure comprises a surface that forms a substantial portion of said back side of said channel structure; and
said coupler comprises a recess/hole that is defined by said surface.

[c37] 37. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said first channel structure comprises a surface that forms a substantial portion of said back side of said channel structure; and
said coupler comprises a pair of recesses/holes that are each defined by said surface.

[c38] 38. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:
said first channel structure comprises a surface that

forms a substantial portion of said back side of said channel structure; and
said coupler comprises a coupler element that extends away from said surface.

[c39] 39. A multi-piece data cartridge magazine, as claimed in claim 18, wherein:

said first channel structure comprises a surface that forms a substantial portion of said back side of said channel structure; and
said coupler comprises a pair of coupler elements that each extend away from said surface.

[c40] 40. A multi-piece data cartridge magazine that is suitable for use with a data cartridge library comprising:
a channel structure that defines an interior space that is capable of accommodating a plurality of data cartridges;
wherein said channel structure comprises a first side with a first side interior surface and a first side exterior surface;
wherein said channel structure comprises a second side with a second side interior surface and a second side exterior surface;
wherein said second side is separated from said first side;
wherein said channel structure comprises a back side with a back side interior surface and a back side exterior

surface;

wherein said first side interior surface, said second side interior surface, and said back side interior surface define said interior space;

wherein said first and second sides define at least a portion of an opening for the insertion/extraction of data cartridge into/from said interior space;

said channel structure comprising:

a first channel structure that comprises a first channel structure first surface that forms a portion of said first side of said channel, a first channel structure second surface that forms a portion of said second side of said channel, and a first channel structure back surface that forms a substantial portion of said back side of said channel;

a second channel structure that comprises a second channel structure first surface that forms a portion of said first side of said channel and a second channel structure second surface that forms a portion of said second side of said channel; and

a coupler for connecting said first and second channel structures.

[c41] 41. A multi-piece magazine, as claimed in claim 40, wherein:

said second channel structure comprises a second chan-

nel structure third surface that connects said second channel structure first and second surfaces.

[c42] 42. A multi-piece magazine, as claimed in claim 40, wherein:
said second channel structure comprises:
a second channel structure third surface that connects said second channel structure first and second surfaces;
and
a second channel structure fourth surface that is separated from said second channel structure third surface and connects said second channel structure first and second surfaces.

[c43] 43. A multi-piece magazine, as claimed in claim 40, wherein:
said first channel structure is made of metal; and
said second channel structure is made of plastic.

[c44] 44. A data cartridge library comprising:
a frame that defines a top surface, a bottom surface that is spaced from said top surface, and a side surface that extends between said top and bottom surfaces;
a data cartridge magazine;
a drive, operatively attached to said frame, for writing data onto a recording medium located within a data cartridge and/or reading data from a recording medium lo-

cated within a data cartridge;
a transport assembly, operatively attached to said frame,
for moving a data cartridge between said data cartridge
magazine and said drive, wherein said transport assem-
bly comprises a picker that is capable of grasping a data
cartridge and an elevator that is capable of moving said
picker;
wherein said data cartridge magazine comprises:
a first side, a second side that is separated from said
first side, and back side that extends between said first
and second sides;
wherein said first, second and back sides define a chan-
nel with an interior space that is capable of accommo-
dating a plurality of data cartridges;
a first channel structure that forms at least a portion of
said back side;
a second channel structure that forms at least a portion
of at least one of said first and second sides; and
a coupler for connecting said first and second channel
structures;
wherein said frame comprises at least a portion of said
first channel structure.

[c45] 45. A data cartridge library, as claimed in claim 44,
wherein:
a portion of said frame defines said side surface; and

at least a portion of said first channel structure defines at least a portion of said side surface.

[c46] 46. A data cartridge library, as claimed in claim 44, wherein:
said first channel structure is made of metal.

[c47] 47. A data cartridge library, as claimed in claim 44, wherein:
said second channel structure is made of the same class of materials as is used to make a housing of a data cartridge.

[c48] 48. A data cartridge library, as claimed in claim 44, wherein:
said second channel structure is made of plastic.

[c49] 49. A data cartridge library, as claimed in claim 44, wherein:
said second channel structure comprises a retainer with a surface for engaging a data cartridge and spring element for urging said surface into engagement with a data cartridge.

[c50] 50. A data cartridge library comprising:
a frame that defines an interior space;
a data cartridge magazine, located within said interior space, that is capable of holding a plurality of data car-

tridges;

a drive bay, located within said interior space, for accommodating at least one full height drive;

a transport assembly, located within said interior space, for moving a data cartridge between said data cartridge magazine and a drive that might be located in said drive bay, wherein said transport assembly comprises a picker that is capable of grasping a data cartridge and an elevator for moving said picker;

wherein said drive bay defines a first opening, a second opening, and a drive space that extends between said first and second openings;

wherein said first opening allows said transport assembly to insert/retract a data cartridge into/from any drive that is located in said drive space;

wherein said second opening allows a user to install/remove a drive into/from said drive bay;

wherein said drive bay comprises a partition mount for supporting a partition that divides said drive space such that a full-height drive space that is located within said drive space and capable of accommodating a full-height drive provides first and second half-height drive spaces that are each capable of accommodating a half-height drive.

[c51] 51. A data cartridge library, as claimed in claim 50, fur-

ther comprising:

a partition for engaging said partition mount in said drive bay.

[c52] 52. A data cartridge library, as claimed in claim 50, wherein:
said full height drive space is capable of accommodating:
(a) a full-height drive that is located within a full-height drive sled or (b) when a partition is engaged to said partition mount within said drive bay, a first half-height drive that is located within a first half-height drive sled that is located with said first half-height drive space, and a second half-height drive that is located within a second half-height drive sled that is located within said second half-height drive space.

[c53] 53. A data cartridge library, as claimed in claim 50, wherein:
said drive bay comprises:
a first drive bay electrical connector that interfaces to said first half-height drive space; and
a second drive bay electrical connector that interfaces to said second half-height drive space.

[c54] 54. A data cartridge library, as claimed in claim 53, wherein:
said first and second drive bay electrical connectors each

face towards said second opening.

- [c55] 55. A data cartridge library comprising:
- a frame that defines an interior space;
 - a data cartridge magazine, located within said interior space, that is capable of holding a plurality of data cartridges;
 - a drive bay, located within said interior space, for accommodating a plurality of full height drives;
 - a transport assembly, located within said interior space, for moving a data cartridge between said data cartridge magazine and a drive that might be located in said drive bay, wherein said transport assembly comprises a picker that is capable of grasping a data cartridge and an elevator for moving said picker;
 - wherein said drive bay defines a first drive space that extends between first drive space first and second openings and is capable of accommodating a first full-height drive;
 - wherein said drive bay defines a second drive space that extends between second drive space first and second openings and is capable of accommodating a second full-height drive;
 - wherein said first drive space first opening allows said transport assembly to insert/retract a data cartridge into/from a drive that is located in said first drive space;

wherein said first drive space second opening allows a user to install/remove a drive into/from said first drive space;

wherein said second drive space first opening allows said transport assembly to insert/retract a data cartridge into/from a drive that is located in said second drive space;

wherein said second drive space second opening allows a user to install/remove a drive into/from said second drive space;

wherein said drive bay comprises a partition mount for supporting a partition that divides said first drive space into first and second half-height drive spaces that are each capable of accommodating a half-height drive.

[c56] 56. A data cartridge library, as claimed in claim 55, further comprising:
a partition engaging said partition mount.

[c57] 57. A data cartridge library, as claimed in claim 56, further comprising:
a half-height drive located in one of said first and second half-height drive spaces.

[c58] 58. A data cartridge library, as claimed in claim 56, further comprising:
a first half-height drive located in said first half-height

drive space; and

a second half-height drive located in said second half height drive space.

[c59] 59. A data cartridge library, as claimed in claims 57 or 58, further comprising:
a full-height drive located in said second drive space.

[c60] 60. A data cartridge library, as claimed in claim 55, further comprising:
a first full height drive located in said first drive space;
and
a second full height drive located in said second drive space.

[c61] 61. A data cartridge library comprising:
a frame that defines an interior space;
data cartridge space, located within said interior space, for providing data cartridge storage locations for all of the data cartridges that the library is capable of storing;
drive space, located within said interior space, for providing drive locations for all of the drives that the library is capable of accommodating;
transport assembly space, located within said interior space, for accommodating the operation of a picker and an elevator in moving a data cartridge between any of said data cartridge storage locations in said data car-

tridge space and any drive locations in said drive space; power supply space, located within said interior space, for accommodating all of the power supplies that the library is capable of accommodating; circuitry space, located within said interior space, for accommodating circuitry for distributing power and controlling said transport assembly; and a universal bay, located within said interior space, that defines a universal space that is capable of accommodating electronic circuitry other than electronic circuitry that is located in said circuitry space and that does not comprise said frame, said data cartridge space, said drive space, said transport assembly space, said power supply space or said circuitry space.

[c62] 62. A data cartridge library, as claimed in claim 61, wherein:

said universal bay comprises a connector board with one or more first electrical connectors for establishing electrical connections with electronic circuitry that may be located in said universal space.

[c63] 63. A data cartridge library, as claimed in claim 62, further comprising:

a card cage, located in said universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with

a corresponding one of said one or more first electrical connectors associated with said connector board.

- [c64] 64. A data cartridge library, as claimed in claim 63, wherein:
said card cage comprises a compact peripheral component interconnect.
- [c65] 65. A data cartridge library, as claimed in claim 63, wherein:
said card cage comprises one of the following: a 3U high card cage and a 6U high card cage.
- [c66] 66. A data cartridge library, as claimed in claim 62, further comprising:
a quad interface processor located in said universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said connector board.
- [c67] 67. A data cartridge library, as claimed in claim 61, wherein:
said universal bay comprises:
a first connector board with one or more first electrical connectors for establishing electrical connections with

first electronic circuitry that may be located in a first universal space within said universal space; and
a second connector board with one or more first electrical connectors for establishing electrical connections with second electronic circuitry that may be located in a second universal space within said universal space that does not include said first universal space.

[c68] 68. A data cartridge library, as claimed in claim 67, wherein:
said universal bay comprises a partition mount for supporting a partition that divides said universal space into said first and second universal spaces.

[c69] 69. A data cartridge library, as claimed in claim 68, wherein:
said universal bay comprises a partition for engaging said partition mount to divide said universal space into said first and second universal spaces.

[c70] 70. A data cartridge library, as claimed in claim 67, further comprising:
a first card cage, located in said first universal space, with one or more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said first connector

board; and

a second card cage, located in said second universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said second connector board.

- [c71] 71. A data cartridge library, as claimed in claim 67, further comprising:
- a first quad interface processor, located in said first universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said first connector board; and
 - a second quad interface processor, located in said second universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said second connector board.

- [c72] 72. A data cartridge library, as claimed in claim 67, further comprising:
- a card cage, located in said first universal space, with one of more second electrical connectors that are each

capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said first connector board; and
a quad interface processor, located in said second universal space, with one of more second electrical connectors that are each capable of establishing an electrical connection with a corresponding one of said one or more first electrical connectors associated with said second connector board.

- [c73] 73. A data cartridge library comprising:
a frame that defines an interior space;
data cartridge space, located within said interior space, that contains a magazine structure for holding data cartridges and that provides data cartridge storage locations for all of the data cartridges that the library is capable of storing;
drive space, located within said interior space, that contains at least one drive and provides drive locations for all of the drives that the library is capable of accommodating;
transport assembly space, located within said interior space, that contains a picker that is capable of grasping a data cartridge and an elevator for moving said picker, and that provides space for accommodating the opera-

tion of said picker and said elevator in moving a data cartridge between any one of said data cartridge storage locations in said data cartridge space and any drive location in said drive space;

power supply space, located within said interior space, that contains at least one power supply and provides space for accommodating all of the power supplies that the library is capable of accommodating;

circuitry space, located within said interior space, that contains circuitry for distributing power and for controlling said picker and said elevator; and

a universal bay, located within said interior space, that defines a universal space which is capable of accommodating electronic circuitry other than electronic circuitry that is located in said circuitry space and which is not within said transport assembly space.

[c74] 74. A data cartridge library, as claimed in claim 73, wherein:
said universal space adjoins said data cartridge space.

[c75] 75. A data cartridge library, as claimed in claim 73, wherein:
said universal space adjoins said drive space.

[c76] 76. A data cartridge library, as claimed in claim 73, wherein:

said universal space adjoins said data cartridge space and said drive space.

[c77] 77. A data cartridge library, as claimed in claim 73, wherein:
said universal space adjoins said transport assembly space.

[c78] 78. A data cartridge library, as claimed in claim 73, wherein:
the location of at least one of said data cartridge space and said drive space prevent said picker from accessing said universal space.

[c79] 79. A data cartridge library, as claimed in claim 73, wherein:
the locations of said data cartridge space and said drive space prevent said picker from accessing said universal space.

[c80] 80. A data cartridge library comprising:
a frame that defines an interior space;
a data cartridge magazine, operatively attached to said frame and located within said interior space, for providing a plurality of data cartridge storage spaces;
a drive, operatively attached to said frame and located within said interior space, for writing data onto a record—

ing medium located within a data cartridge and/or reading data from a recording medium located within a data cartridge;

a picker that is capable of grasping a data cartridge, releasing a grasped data cartridge, inserting a grasped data cartridge into a data cartridge storage space in said data cartridge magazine, inserting a grasped data cartridge into said drive, retracting a grasped data cartridge from a data cartridge storage space in said data cartridge magazine, and retracting a grasped data cartridge from said drive; and

an elevator for moving said picker such that said picker can perform grasping, retracting and inserting operations in the moving of a data cartridge between any one of said data cartridge storage spaces and said drive; and wherein said elevator comprises:

an electric motor;

an elevator carriage have a first end and a second end that is separated from said first end;

a first drive system for applying a force to said first end of said elevator carriage;

a second drive system for applying a force to said second end of said elevator carriage; and

a shaft for transferring a force from said first drive system to said second drive system.

[c81] 81. A data cartridge library, as claimed in claim 80,
wherein:
said shaft comprises:
a first shaft portion that is operatively connected to said
first drive system;
a second shaft portion that is operatively connected to
said second drive system; and
a user-actuable connector for connecting said first
shaft portion and said second shaft portion.

[c82] 82. A data cartridge library, as claimed in claim 81,
wherein:
a slidable spline sleeve associated with the other of
said first and second shaft portions.